Some Observations on the Behaviour of the Incubating Redwattled Lapwing, *Vanellus indicus indicus* (Bodd.)

BY

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(*With one plate and two text-figures*)

Reactions of brooding birds to the external environment, physical as well as biological, are of special interest to ornithologists. With the advent of the breeding season, profound changes appear in the behaviour of birds and these changes may be due to changes in their physiological state. Even though our knowledge of these physiological changes is incomplete, their ultimate effect on behaviour, at least in certain cases, is better understood. More factual information on breeding behaviour, therefore, is of importance in understanding the evolutionary pattern in bird behaviour.

The present work records some observations made on the behaviour of a pair of nesting Redwattled Lapwings [*Vanellus indicus indicus* (Bodd.)]. Since this bird lays on bare ground exposed to the sky and not in the shade, the eggs have to be protected against (1) changes in the physical environment, (2) egg predators, and (3) cursorial animals likely to trample upon the eggs inadvertently.

The nest, when discovered on 27 April 1960, was just a shallow pit made in open ground, and contained the complete clutch of four eggs. Even though the field in which the nest was situated was surrounded by luxuriant evergreen trees, the nest was exposed to solar radiation throughout the day because it was situated right in the middle of the barren field, from which a crop of jowar had already been harvested.

For closer observation and photography, a small inconspicuous hide was erected at a distance of five feet from the nest. The birds soon got accustomed to the presence of the hide, which obviously altered the original barrenness of the surrounding area. Since sexual dimorphism in the Lapwing is not distinct enough for quick field identification, it was necessary to mark at least one bird, so that one member of the pair could be distinguished from the other. Initially, several unsuccessful attempts were made to mark the bird by spraying paint on it with a

large syringe. This had to be done from the hide and, owing to the narrow field of view through a small opening in the hide, the bird could not be accurately aimed at, every time the bird moving quickly away from the site. After several attempts a few drops of paint did stick on the back of the bird, but they were not conspicuous enough against the dark plumage. It was therefore decided to capture the bird for marking. This was accomplished with the help of nylon mist nets. Since the nets used had a mesh size of 1 in. and were designed to capture birds much smaller than the lapwing, we had to use them in a slightly unconventional manner. Two mist nets were installed at an angle to one another at a distance of about ten feet from the nest, in such a way that these nets formed the two sides of an equilateral triangle with the hide as the base, and the nest in the centre of the triangle. A gap of about eight inches was left between the lower border of the nets and the ground. After setting this trap, one of us took cover in the hide and sat waiting for the bird to return. This was done late in the morning, well after sunrise, since the bird would soon return to the nest because of its anxiety to keep it protected from the blazing sun. The bird, which till then was observing our movements, quickly made towards the nest site from the direction opposite to the hide, in spite of the fact that the nets, without any dark background, were clearly visible even from a considerable distance. When the bird came very close it paused for a few seconds, then walked a couple of steps along the side of the net and, ducking a little, passed through the gap under the net. Once inside the enclosure it walked straight to its nest and sat on the eggs, wary and watchful, looking from time to time at the unfamiliar sight of the nets. After a few minutes the hiding observer came out all of a sudden without giving any previous warning to the bird. Upon this the bird hurriedly got up, took a step or two and flew off in the opposite direction right into the net. Before the bird had time to get out of the net, it was grabbed. The white patch on one side of its neck was adequately painted red with alcoholic eosine stain. The nets were quickly removed and the bird was released. It flew away fast, greatly agitated, uttering continuous sharp notes, and disappeared towards its feeding ground. Instantaneously, its mate came hurriedly flying from the same direction and uttering similar notes. But by that time we had already moved away to a distant observation post. The unmarked bird flew around the field in a complete circle but, seeing no visible sign of danger, alighted on the border of the field and walked hurriedly straight to the nest, all the while uttering sharp notes. On reaching the nest it appeared reassured and quickly sat on the eggs. The birds were left to themselves and for the rest of the day no further observations were made. A reference to existing literature and our own observations made during the subsequent days made it obvious that the marked bird was female, and the unmarked one the male. The male

was found to relieve the female from duty at the nest only during the hotter part of the day, and while at the nest he appeared more wary and watchful than the female. In the description to follow, the marked and the unmarked birds will be referred to as female and male respectively. At no time was any lapwing other than these two birds observed around the nest site.

Two days after marking the bird, the movements of the pair around the nest were watched continuously for eleven and half hours. In order to avoid any disturbance which might modify the movements of the birds at the nest site, the hide was abandoned on that day and, instead, all the observations were made from a distance of about 150 feet with a pair of binoculars, and recorded on the spot. Later, for twenty days the birds were observed at least for a few hours daily. We were then expecting the young ones to hatch out any day. But, as fate would have it, one early morning before sunrise when it was still dark, the owner of the field inadvertently destroyed the entire nest while ploughing. However, he left the hide undisturbed, because, as he said afterwards, he knew that we were doing something of importance inside the hide, but did not know that our object of study, which made us sit within the hide, often in blazing sun, was in fact outside it !

The following are the observations made on the behaviour of this pair of lapwings, presented under appropriate headings.

Rhythm of activities at nest site:

The sequence of events presented below is based on continuous observations made during eleven and half hours on a single day. The notes are just as they were recorded on the spot in our field-notebook:

6-30 hrs. No bird on the nest. Male standing at a distance of about 30 feet from the nest.

6-45 hrs. The female arrives on the scene and is seen standing at a distance of about 80 feet away from the nest and preening its feathers.

7-01 hrs. A dog happens to cross the field. When it comes to a distance of about 40 feet from the nest, the female stops preening and flies towards the dog. Uttering sharp notes, it makes some attempts at pecking the dog. Attention of the dog is drawn towards the bird. The bird now flies quite low, alighting from time to time on the ground in front of the dog, but always remaining about eight feet away from it. When the dog is about 250 to 300 feet away from the nest, the bird stops luring it further. This entire operation is completed within 3.75 minutes. The male is not to be seen anywhere around.

7-42 hrs. The female from the border of the field walks to the nest.

7-44 hrs. The female sits on the eggs.

7-47 hrs. The female gets up and leaves the nest.

7-52 hrs. The sun rays start spreading over the field.

7-54 hrs. The female returns once again to the nest and starts incubating. The male appears on the scene.

8-14 hrs. The female leaves the nest.

8-15 hrs. Both the male as well as the female are seen attacking and chasing away a crow from the field.

8-27 hrs. The female returns and sits on the eggs.

8-33 hrs. The male attacks a crow near by, while the female continues to incubate.

8-43 hrs. A kite flies about 50 feet high over the nest. The sitting female reacts to it by straightening out neck and tail, keeping them parallel to the ground.

10-00 hrs. The male comes to the nest and takes over from his mate the duty of covering the eggs. The female walks away from the nest.

10-26 hrs. The female flies away from the scene.

10-46 hrs. The female returns.

11-07 hrs. The female comes to the nest and takes over incubation from the male. The male disappears from the scene.

11-45 hrs. The male appears on the boundary of the field and walks briskly straight to the nest.

11-46 hrs. The male relieves the female from duty at the nest. The female walks to the border of the field and waits in the shade of a tree.

12-18 hrs. The female takes charge of the eggs from the male. The male walks away and waits in the tree shade.

13-03 hrs. The male takes charge of the eggs from the female, which in turn walks away to the shade.

13-07 hrs. The female disappears from the scene.

13-47 hrs. The female re-appears.

13-52 hrs. The female goes to the nest and relieves the male. The male walks to the tree shade.

13-57 hrs. The male flies away from the scene.

14-33 hrs. The male re-appears.

14-36 hrs. The female is relieved at the nest by the male. The male sits on the eggs. The female walks away.

14-39 hrs. The female flies away.

15-09 hrs. The female arrives.

15-11 hrs. The female takes charge of incubating from the male. The male walks away and stands under a tree.

15-44 hrs. The male flies away from sight.

15-58 hrs. The male returns.

16-02 hrs. The male takes charge of the eggs from the female.

16-03 hrs. The female disappears.

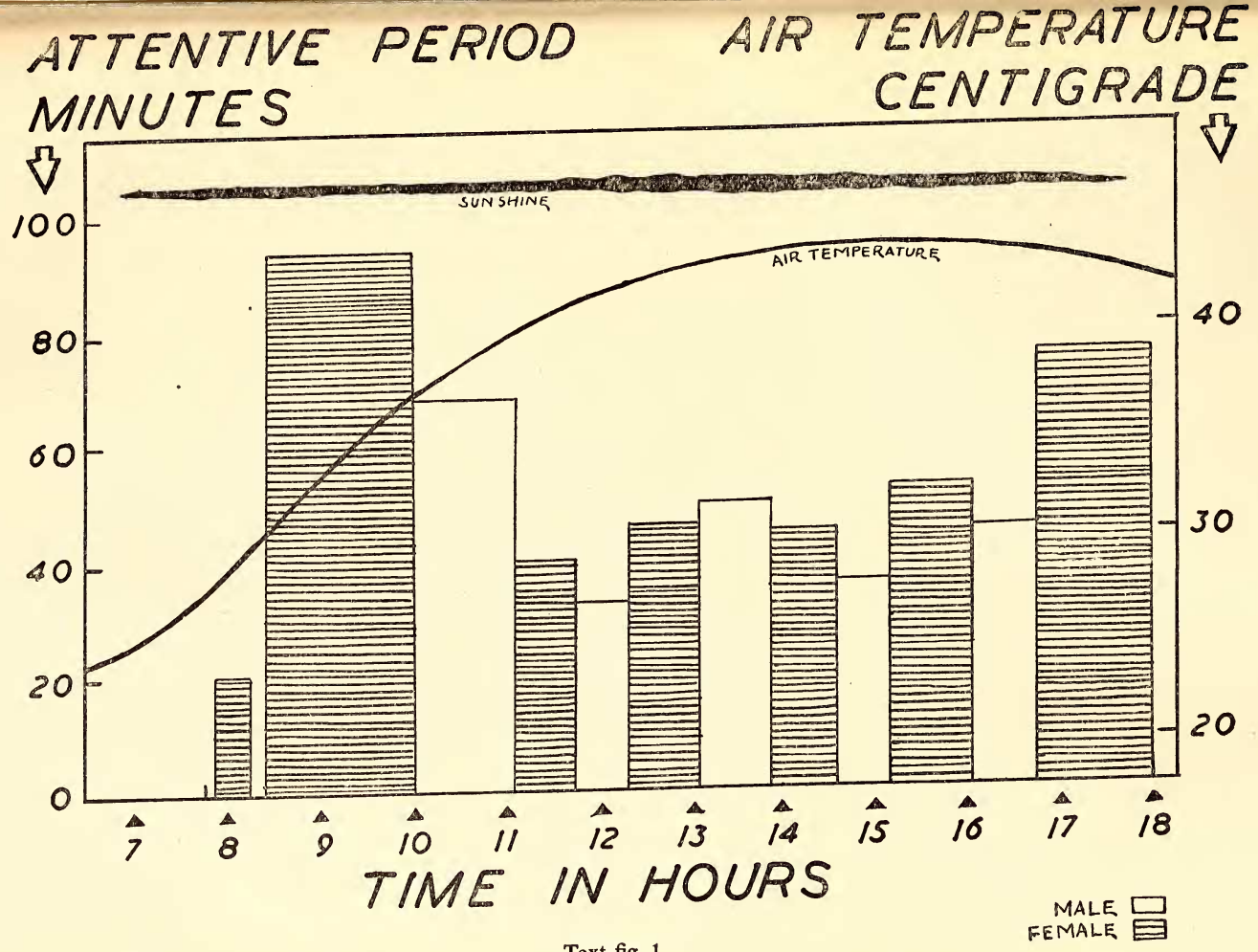
16-39 hrs. The female returns.

16-46 hrs. The female relieves the male at the nest.

18-00 hrs. The female is still sitting on the eggs when watching terminates for the day.

Protection of eggs against solar radiation:

Figure 1 is a histogram showing the attentiveness of the birds at their nest during day time, based on the observations presented above. From the figure it is clear that in the early morning, and probably also in the late evening, the eggs are covered by the female alone, whereas during the crucial part of the day when the air temperature is high and solar radiation intense, the male and the female attend the nest in turns. In the morning when the air temperature is low, the eggs may remain uncovered for varying intervals of time. But from 8-30 a.m. onwards



Text-fig. 1

Histogram of attentiveness at the nest of Redwattled Lapwing in relation to air-temperature and sunshine

The air-temperature and sunshine were recorded at the M. S. University Meteorological Observatory, about half a mile away from the nesting site. The thickness of the sunshine line indicates the intensity of solar radiation. Observations began at 6.30 hrs. and ended at 18 hrs.

the eggs are kept continuously covered. While changing duty at the nest, the sitting bird will get up only after its mate has approached very close to it (Plate, Fig. 1), so that the eggs remain uncovered only for a brief interval.

Incidentally, the question arises whether the lapwing sitting on the nest actually incubates, i.e. applies heat to, the eggs. It has been shown in several species that the bird may sit over the eggs without applying heat to them (Van Tyne & Berger, 1959). Thus, sitting on the eggs does not necessarily mean incubating, but this could be ascertained correctly only by placing thermo-couples in contact with the eggs. However, the lapwing when about to sit on the eggs, raises the breast feathers (Plate, Fig. 2) so that when it sits down, the eggs probably come in contact with skin. Thus, when the lapwing is sitting on eggs in the daytime it is not merely covering them to shade them from the sun's rays but it is probably incubating them as well.

Since the bird on duty at the nest sits exposed to solar radiation, it has to protect itself against rise in body temperature. As the day advances the changing over of duty at the nest occurs more frequently. Between 11 a.m. and 3 p.m. the frequency of the change-over is highest, a change-over taking place approximately every 40 minutes. But later on as the day advances further the frequency of the change-over decreases. During the hotter part of the day, the bird sitting on the nest is seen continuously panting and pulsating the gular area and raising up its feathers whenever there is the slightest breeze (Plate, Fig. 3). This is mainly to facilitate evaporative cooling. On the other hand, the bird, as soon as it is relieved at the nest, seeks the tree shade.

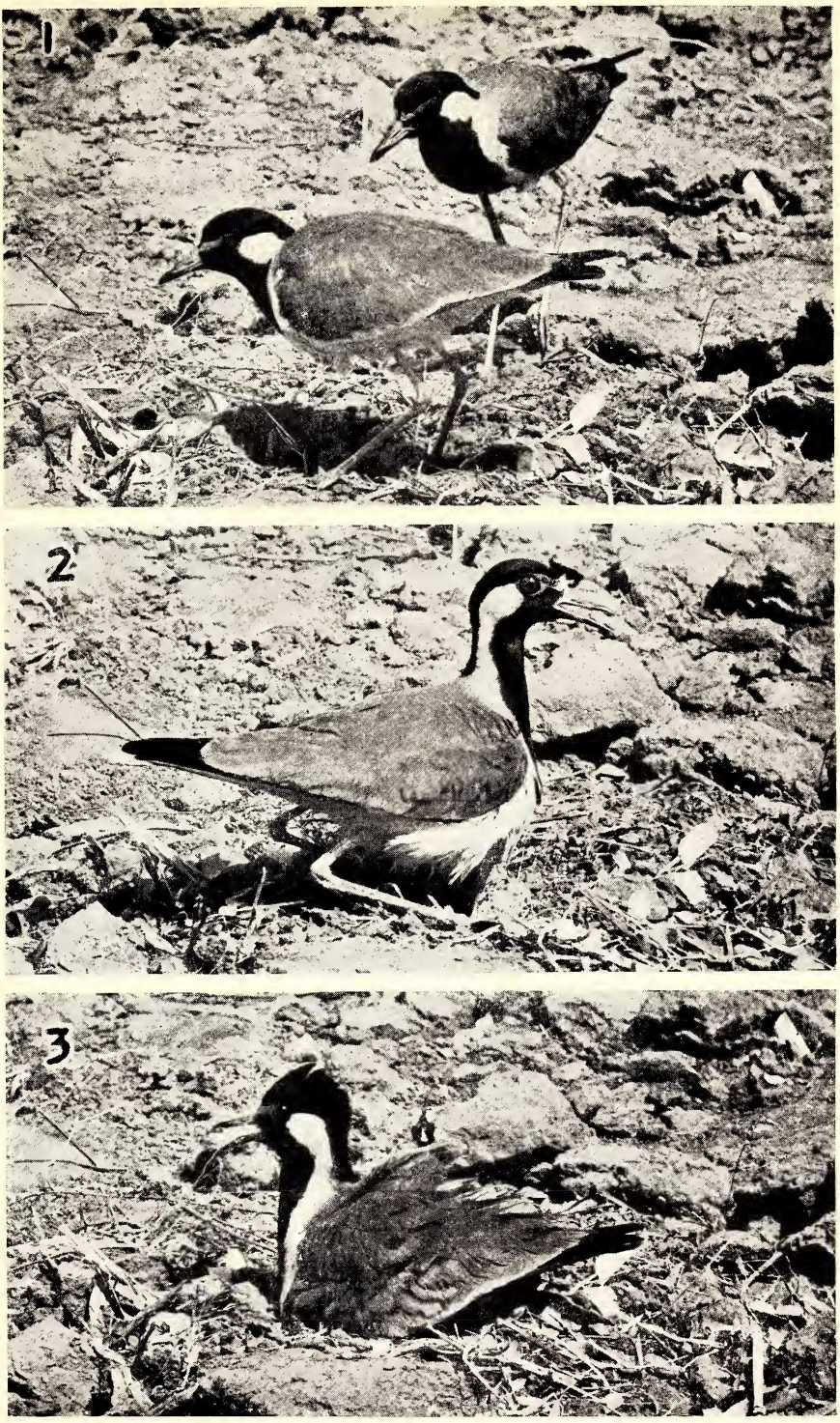
Protection of eggs against predators and cursorial animals:

During the course of observations we had the chance to observe the reactions of the lapwing towards kites, crows, dogs, cattle, and humans.

The bird sitting on eggs, owing to its broken colour pattern of black and white on the neck and the dull coloration of the back, matches very well with the shadows cast by earthen clods scattered all over the field. The lapwing has this advantage of camouflage only because it nests on open ground and never in the shade of a tree. Moreover, during the heat of summer, when the shade of the trees is much sought after by arboreal and cursorial animals, the ground under a tree is a highly unsafe place for the bird's nesting.

To any approaching intruder, whether a crow or a kite flying overhead, or cattle grazing around, or a human crossing the field, the first reaction of the incubating bird is to straighten out head, neck, and tail, keeping them parallel with the ground, and at the same time to freeze all movement, so much so that the bird even stops the gular pulsations.

Redwattled Lapwings at the nest



1. Changing over of duty at the nest. 2. Bird about to sit on eggs. Note the raised up breast feathers. 3. Bird sitting on eggs. Feathers on back and head raised up and mouth kept open to cool the body. (All the photographs were taken before marking the bird.)

Photos : Authors